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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/583,854

06/21/2006

Takuya Tsukagoshi

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7590

08/26/2009

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P.O. BOX 320850

ALEXANDRIA, VA 22320-4850

EXAMINER

CHANG, AUDREY Y

ART UNIT

PAPER NUMBER

2872

MAIL DATE

DELIVERY MODE

08/26/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/583,854	Applicant(s) TSUKAGOSHI ET AL.	
	Examiner Audrey Y. Chang	Art Unit 2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 May 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3,6-8,10,12-14,17 and 20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3,6-8,10,12-14,17 and 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 27, 2009 has been entered.
2. This Office Action is also in response to applicant's amendment filed on May 27, 2009, which has been entered into the file.
3. By this amendment, the applicant has amended claim 1.
4. Claims 1, 3, 6-8, 10, 12-14, 17 and 20 remain pending in this application.

Response to Amendment

5. The amendment filed **May 27, 2009** is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: claim 1 has been amended to include the phrases "forming data pages ... by angle-multiplex-recording" and "forming data pages assigned the same page number". The specification fails to teach that the data pages are formed by angle-multiplex-recording. The data pages cannot be formed by such recording method rather it is the *holograms* being formed by angle-multiplex-recording data pages. The specification also fails to explicitly state that the same data page number is assigned in the way recited in the amended claim 1.

Applicant is required to cancel the new matter in the reply to this Office Action.

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Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. **Claims 1, 3, 6-8, 10, 12-14, 17 and 20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.** The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The reasons for rejections based on the newly added matters are set forth in the section "response to amendment" above. The specification disclose the method for forming holograms and access method for accessing hologram not a method for forming data pages. The applicant being one skilled in the art must known that the data pages are used to modulate the object beam so that interference of the object beam and a reference beam is recorded in the medium as holograms. The holograms are totally different from data pages.

8. **Claims 1, 3, 6-8, 10, 12-14, 17 and 20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.** The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification simply fails to teach that the data pages are formed by the angle-multiplex recording of interference fringes. The angle-multiplex-recorded interference fringes are holograms not data pages. Data pages are completely different from holograms. The claims are therefore non-enabling by the specification.

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The applicant is respectfully noted, that instead of the data pages being formed, it is the "forming a plurality of holograms" by angle-multiplex-recording interference fringes between a common reference beam, incident along an *optical path* (not a line, the line is not defined) and extended through the holographic layers, and a respect one of a plurality of object beams each contains information of a data page and incidents one of the holographic recording layers at different incident angle.

The specification also fails to teach how to assign the data page number to the data page. It appears that the assignment of the data page number is arbitrary.

The specification fails to teach how to access the data blocks based on "a number assigned to each of the data blocks". The specification while teaches to reconstruct the data pages it fails to teach how to reconstruct individual data blocks in each of the data page. In the reconstruction process, a single data page is retrieved, i.e. all of the data blocks are reconstructed together, so no individual block can be accessed.

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. **Claims 1, 3, 6-8, 10, 12-14, 17 and 20 are rejected under 35 U.S.C. 112, second paragraph**, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is not clear the "access method" is for accessing what? The phrase should be better read as "an access method for accessing holograms recorded in a multi-layer holographic recording medium including a multi-layer holographic recording layer formed by laminating a multitude of holographic recording layers".

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The phrase "a line extends through the holographic recording layers" that is confusing since it is not clear what is considered to be this line. The line also seems to be arbitrarily defined. It is better read as the "optical path" defined by the single reference beam.

The phrase "forming data page ... having different incident angle to holographic recording layers" recited in claim 1 is confusing and wrong. It should be better read as "forming a plurality of *holograms* in holographic recording layers by angle-multiplex-recording interference fringes between a common reference beam, incident along an *optical path* extended through the holographic recording layers, and a respect one of a plurality of object beams each contains information of a data page and incidents on one of the holographic recording layers at different incident angle".

The phrase "forming a plurality of data blocks..." should be better read as "each of the data page is further divided up into a plurality of data blocks".

The phrase "shift-multiplex-recording over an entire area ... the data page..." recited in claim 1 is confusing since it is not clear if this recording is referred to a holographic recording or not. The phrase is better read as "forming a plurality of holograms by shift-multiplex-recording a plurality of data pages with assigned data page numbers from 1 to M, over an entire area of each respective holographic recording layers".

The specification fails to teach how to assign the "same data page" so that it is being examined in the interpretation that all the holograms being reproduced by a single reference beam is considered to be recorded by the data pages with the same data page number.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. **Claims 1, 3, 6-8, 10, 12-14, 17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Goulanian et al (PN. 7,321, 540) in view of the patents issued to Spitz et al (PN. 4,052,706), Meyrueis et al (PN. 7,200,097), and Meyrueis et al (PN. 7,049,190).**

Goulanian et al teaches a *multilayer holographic data storage* with data accessing method included wherein a *plurality of data pages* having *data blocks structure* as shown in Figure 3 is recorded in a multilayer structure of holographic storage medium having *a plurality of recording layers* (11, Figure 1a, with "i" being the identifier for the layer number). The data pages can be *angle multiplexed* recorded in each recording layers, (please see Figure 1a and 16, column 8, lines 5-14 for the angle multiplexing method). The multilayer structure of the recording layers is formed by laminating the recording layers as shown in Figure 1a. Goulanian et al teaches that while accessing the data recorded, a *layer and row accessing unit* (30, Figure 5, column 5, lines 1-8) is used to access the data according to specified layer and data page at the specified row. Goulanian et al teaches that each recording layer is identified by symbol "i" that serves as *the layer number* and hologram for each data page on the recording layer is identified by *row index "j"* and *index "k"* that serve as *number assigned to the data page*. The hologram is therefore identified as 14_{ijk} , that is specified by layer number and data page number. And the accessing method via the layer and row accessing unit is based on the identifiers stated above.

Claim 1 has been amended to include the phrase concerning "forming data pages assigned the same page number on a line that extends through the holographic recording layer". It is noted that it is not the data pages being formed, rather it is a plurality of holograms being formed by angle-multiplex-recording a plurality of data pages. The claims therefore are being examined in this interpretation however the amendment to the claims to correct the errors are required. **Claim 1 has been amended** to further include the phrase "angle-multiplex-recording interference fringes using a common reference

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beam that extends along the line and a respect one of a plurality of object beams each object beam having a different incident angle to holographic recording layers”. Each of the data pages is recorded by the angle-multiplex-recording in a *respective* layer. One skilled in the art must understand that angle-multiplexing recording method is achieved by varying the angle between the reference beam and object beam for bearing the data to be recorded. The angle variation can be achieved *either* by varying the incident angle of the object beam or the reference beam. **Goulanian** et al demonstrates one of the methods, by varying the incident angle of the reference beam as shown in Figure 16. **Meyrueis** et al (‘097) in the same field of endeavor demonstrates a different method by using a common reference beam and a plurality of object beams each with a different incident angle, (please see Figure 1B). It is therefore obvious to one skilled in the art to adapt the method and arrangement of Meyrueis et al (‘097) as an alternative method for achieving the same angle-multiplex recording. Meyrueis et al (‘097) further teaches that in the retrieving process, the common reference beam is illuminated the recording medium wherein a plurality diffracted beams along the directions of the original object beams are reconstructed and a plurality of detectors are used to receive and detect each of the reconstructed object beam. These references do not teach explicitly that the angle-multiplex-recording holograms are formed in the respective holographic recording layers. However using angle-multiplex scheme to record a plurality of data pages in a multi-layer format is really well known in the art as demonstrated by **Meyrueis** et al (‘190) wherein a plurality of hologram packets (8b, Figure 3) formed in the multi-layer format are recorded by angle multiplex scheme, (column 6, liens 27-30). It would then have been obvious to one skilled in the art to modify the multilayer holographic data storage of Goulanian et al so that the holograms recorded in different layers are achieved by angle-multiplexing scheme as an alternative way to increase the capacity of the data stored.

This reference has met all the limitations of the claims with the exception that it does not teach explicitly that the data blocks contained in each data page is further identified by a number assigned to the

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blocks and the block of the data can be accessed via the assigned block number. **Spitz** et al in the same field of endeavor teaches a *data page* including a plurality of data blocks (9 data blocks as shown in Figure 2) that each data block can be accessed. The data blocks in each page can certainly be identified by a number for indicating row and column location of the block. It would then have been obvious to one skilled in the art to apply the teachings of **Spitz** et al to further identify the data blocks of each data page of **Goulanian** et al (as shown in Figure 3) by number assigned to individual block with column and row indicators to further access the data blocks of each data page in the holographic storage medium for the benefit of allowing individual data block be accessed and read.

Claim 1 has further been amended to include the phrase "shift-multiplex-recording over an entire an area in the respective holographic recording layers a plurality of data pages". Goulanian et al teaches that that a plurality of holograms are being recorded on an entire area of each of the holographic recording layers. Each of the holograms can be regarded to be a record in associates with a data page. Although this reference does not identify that such shiftily arranged holograms are recorded by shift-multiplexing scheme, such modification is either implicitly included or obvious modified. Since as demonstrated by **Meyrueis** et al ('190) the spatially-arranged holograms (8a, Figure 3) on entire area of a holographic layer are recorded by spatially multiplexing method also known as shift multiplexing method, (please see column 6, lines 20-25). It would then have been obvious to one skilled in the art to apply the teachings of **Meyrueis** et al ('190) to record the data pages also with shift or spatial multiplexing method to facilitate the increase of the density of recording sharply.

Claim 1 has also been amended to include the phrase such that "forming data pages assigned same page number on a line extends through the holographic recording layers". This phrase is confusing and rejected under 35 USC 112, second paragraph for the reasons stated above. This can only be examined in the broadest interpretation. If this is referred to all the data pages used to be angle-multiplex-recorded by using a single common reference beam, is being assigned as the same page number, then this

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means all the data pages being reconstructed by the single reference beam as shown in Meyrueis et al ('097) are being assigned to have the same page number.

With regard to the phrases concerning the reading beam to have the same wavelength and same angle for as the recording beams, such is implicitly met by the disclosure of all the cited references, since this is the necessary criterion for recording and retrieving holograms.

Claim 1 has further been amended to include the phrase "changing the number to be accessed by rotating the multi-layer holographic recording medium". Goulanian et al teaches to use an angle deflector to change the incident angle of the reading beam for accessing the angle-multiplexed recorded data and to access data pages recorded in different recoding layers. Although this reference does not teach explicitly to rotate the recording layers to access different data pages, however such modification must have been obvious to one skilled in the art to access the holograms recorded in different layers and at different location on each of the layers.

With regard to claim 3, the number for specifying the data blocks has to include a row number and column number since the data blocks (as shown in Figure 3 of Goulanian et al and Figure 2 of Spitz et al) are arranged in two dimensional matrix with rows and columns.

With regard to claim 6, it is implicitly true that the photodetector array (50) of Goulanian et al has same two dimensional arrangement with the arrangement of data pages in order to receive the reproduced data from each pages row-by-row, (please see Figure 5). Although this reference does not teach explicitly that the photodetector array are comprised of imaging devices, but as shown by Meyrueis et al ('097) CCD or charge couple device, which is an imaging device, is a well known photodetector. It would then have been obvious to one skilled in the art to use a standard CCD as the photodetector. With regard to **amendment** of claim 6, **Meyrueis et al ('097)** teaches explicitly that different photodetector is used for receiving and detecting reconstructed object beam from the angle-multiplexed recorded data. This means

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the photodetector can be assigned with the same number as the number for the specific data page being detected.

With regard to claims 7-8, 12, and 17, Goulanian et al teaches that the data accessing process involves successively accessing each data page with the layer and row accessing unit (30). The holographic recording layer can be changed for the accessing process. However it does not teach explicitly that a process of simultaneously reading a plurality of data pages. **Meyrueis** et al ('097) teaches the data pages may also be recorded in angle multiplexing scheme disclosed such that a single reference beam (410, Figure 4) is used to simultaneously read out a plurality of data pages recorded, (please see Figure 4). It would then have been obvious to one skilled in the art to apply the teachings of **Meyrueis** et al ('097) to modify the recording so that a plurality of data pages can be simultaneously retrieved as an alternative way of recording to provide option for simultaneously reading out data. The retrieving or reading process is achieved necessarily by illuminating a single laser to the holographic recording medium.

With regard claim 13, **Goulanian** et al teaches that the reproduced holographic data, according to layer and rows are received and detected by photodetector array (50, Figure 5) but it does not teach explicitly that the layer number of the recording layer is identified by number assigned to each of two-dimensional optical detectors such that each of the detectors is provided for a respective one of the holographic recording layer. However whether to have specific photodetector for specific recording layer or not, does not affect the function of having photodetector array to detect the reproduced holographic data according to each recording layer. **Meyrueis** et al ('097) in the same field of endeavor teaches a angle multiplex recorded holograms in recording medium wherein each reproduced data page is detected by an independent detector (CCD) as shown in Figure 4. It would have been obvious to one skilled in the art to modify the arrangement of the photodetector array (50) of **Goulanian** et al to arrange them so that the detector is identified with the specific recording layer to make the detected holographic data with

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better identification and organization. It is implicitly true that the data pages reproduced are along the optical path of the reading beam.

With regard claim 14, Goulanian et al teaches that the reproduced holographic data, according to layer and rows are received and detected by photodetector array (50, Figure 5) but it does not teach explicitly that the layer number of the recording layer is identified by number assigned to each of two-dimensional optical detectors such that each of the detectors is provided for a respective one of the holographic recording layer. However whether to have specific photodetector for specific recording layer or not, does not affect the function of having photodetector array to detect the reproduced holographic data according to each recording layer. Meyrueis et al ('097) in the same field of endeavor teaches a angle multiplex recorded holograms in recording medium wherein each reproduced data page is detected by an independent detector (CCD) as shown in Figure 4. It would have been obvious to one skilled in the art to modify the arrangement of the photodetector array (50) of Goulanian et al to arrange them so that the detector is identified with the specific recording layer to make the detected holographic data with better identification and organization. The detection of the data has to be along the optical path of the reading light.

With regard to claims 10 and 20, Goulanian et al teaches that the data accessing process involves successively accessing each data page with the layer and row accessing unit (30). The holographic recording layer can be changed for the accessing process.

Response to Arguments

13. Applicant's arguments filed on May 27, 2009 have been fully considered but they are not persuasive. The newly amended claim 1 has been fully considered and it is rejected for the reasons stated above.

14. In response to applicant's arguments which states that the cited Goulanian et al reference teaches that the holographic recording layers are made separately and then attached to each other which therefore

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prevents the holograms in different layers to be recorded in angle-multiplexing method, the examiner respectfully disagrees for the reasons stated below. Judging from the paragraph of cited Goulanian et al reference (column 4, lines 22-32), the Goulanian et al does not teach explicitly that each holographic layers are recorded separately and then attached to each other, rather it teaches that the hologram layer and the waveguide layer can be made separately and attached to each other. Also the hologram recording layers are made separately and then attached to each other just reads on claim 1 concerning the multi-layer holographic recording layer formed by **laminating** a multitude of holographic recording layers. The cited reference never teaches that the holograms are separately recorded in each layers and then attached the layers together. Furthermore, the cited Goulanian et al teaches the same method for accessing holograms recorded on multi-layer holographic recording medium. The access method is totally independent to do *how* the holograms are recorded. Namely, the angle-multiplexing scheme and shift-multiplexing scheme do not affect the accessing method of the plurality of holograms recorded in entire area of each of the layer and in the multiple layers.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 571-272-2309. The examiner can normally be reached on Monday-Friday (9:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephone B. Allen can be reached on 571-272-2434. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Audrey Y. Chang, Ph.D.

***/Audrey Y. Chang/
Primary Examiner, Art Unit 2872***